

# NASA TECH BRIEF

## Lyndon B. Johnson Space Center



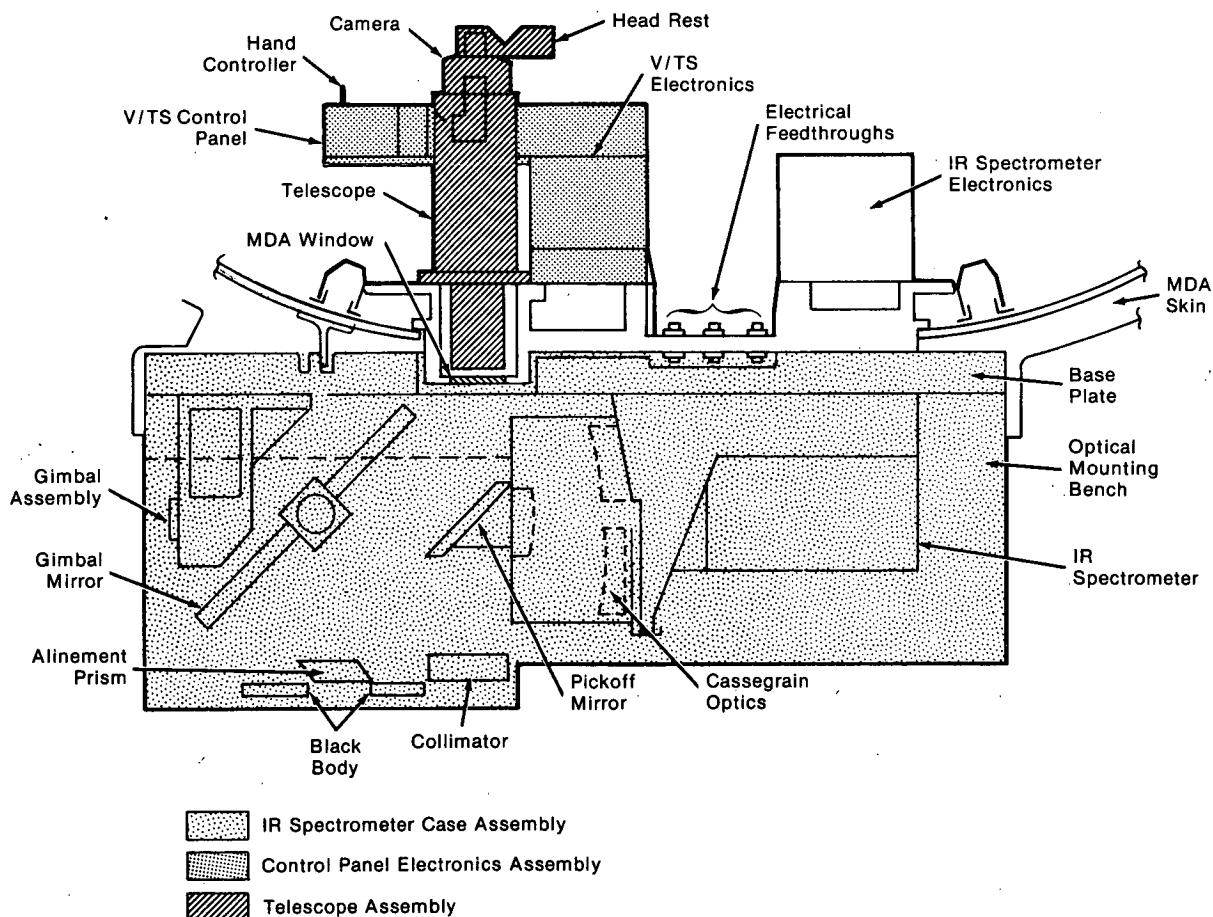
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### Viewfinder/Tracking System for Skylab

A viewfinder/tracking system (V/TS) was developed as a part of an Earth-resources experiment package (EREP) for the Skylab program. The basic component of the system is an infrared (IR) spectrometer designed for manual target acquisition, pointing and tracking, and data-take initiation. The spectrometer system is guided with a two-axis hand controller operating two servos. It is rate-aided in pitch to provide rapid uniform scanning, and it

contains sufficient magnification and resolution to acquire a 1-second spectral scan of 1 square nautical mile ( $3.6 \text{ km}^2$ ), by pointing a 1-milliradian field of vision at the center of the target.

The system incorporates three main subsystems which include: (1) a viewfinder telescope, (2) a control panel and electronics assembly, and (3) an IR-spectrometer case assembly.



Viewfinder/Tracking System

(continued overleaf)

The viewfinder telescope is a variable power telescope with a reticle reference boresighted to the spectrometer line of sight. Magnification power is changed by a manually-controlled but electrically-operated zoom lens (10 to 1 ratio). Low magnification provides wide latitude in target acquisition, and high magnification provides fine pointing and tracking.

An integrally-mounted camera optics provides an optical image, taken from the telescope field of view, for photographing by a data-acquisition camera or for viewing by a color-television camera. Only one of the two cameras is mounted on the optics housing at one time.

The viewfinder control and display panel houses a hand controller and other necessary controls and displays, to actuate and operate the V/TS.

The control panel and electronics assembly contain tracking reference position loops, feedback networks, and servo-amplifiers that are necessary to position the gimbaled mirror assembly. The electronics also provide image-motion compensation drive to the gimbaled mirror assembly in the along-track axis.

The IR-spectrometer assembly is externally mounted to the multiple docking adapter (MDA), and it contains the gimbaled mirror assembly, a cassegrain optics system, a pickoff mirror, and a collimator.

The gimbaled mirror is an elliptical plane mirror mounted in a two-axis gimbal configuration; the crosstrack gimbal rotates inside the along-track gimbal. The viewfinder optic axis coincides with the spectrometer optic axis. The mirror is driven in both axes by servodrivers to permit acquisition and tracking of ground targets. It is controllable through a range necessary to permit the line of sight to be directed  $10^\circ$  aft,  $45^\circ$  forward along the ground track, and  $\pm 20^\circ$  across the ground track.

The cassegrain optics system consists of primary and secondary mirrors suspended on a framework, which serves to fix the relationship between the two mirrors. The framework also provides a means of

adjustment for the assembly, to permit focusing the total collected energy on the IR-spectrometer objective. A  $45^\circ$  pickoff mirror is mounted on the same framework as the cassegrain-system secondary mirror, to allow ground-scene viewing with the telescope and boresighting the viewfinder telescope to the spectrometer optical axis.

The collimator, which consists of two lenses, a mask target, and a light source, supplies a two-degree (full-field diverging beam) image of the mask to a dual  $45^\circ$  prism located in the center of the blackbody reference source.

#### Notes:

1. The described system can be modified for aircraft to study atmospheric, oceanographic, pollutant, and geological targets.
2. This system is described in the following reports:  
Reference: NASA CR-133967 (N73-73509)  
Ground Operating and Handling Procedure for Viewfinder/Tracking System  
Single document price \$5.25  
(or microfiche \$2.25)  
Reference: NASA TMX-69040 (N73-70355)  
Skylab Experiment Operations Handbook  
Single document price \$3.25  
(or microfiche \$2.25)

These reports may be obtained from:

National Technical Information Service  
Springfield, Virginia 22151

#### Patent status:

NASA has decided not to apply for a patent.

Source: W. L. Casey et al. of  
Martin Marietta Corp.  
under contract to  
Johnson Space Center  
(MSC-14407)